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First records of *Synpalamides phalaris* (Fabricius, 1793) (Lepidoptera: Castniidae) in Venezuela, with comments on its natural history

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Abstract

New records of *Synpalamides phalaris* (Fabricius, 1793) (Lepidoptera: Castniidae), collected from Venezuela, one of them from the Orinoco Delta, are presented. A brief historical account, brief description, comparison with specimens from other South American regions, natural history notes and illustrations are included.

Key words

Giant butterfly-moths, Orinoco delta, northeast Venezuela.

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Introduction

Giant butterfly-moths in the Castniinae (Lepidoptera: Castniidae) are a remarkable Neotropical subfamily of mostly diurnal or crepuscular moths with around 88 species distributed in 16 genera (Moraes and Duarte 2014, Ríos et al. 2015). Castniinae is distributed from Mexico throughout Central America and South America south to Argentina and Chile (Miller 1986, González and Cock 2004). Even though the information on giant butterfly-moths from Venezuela is scattered, at least 9 genera and more than 20 taxa of Castniinae are known from the country (González 1981, González 1990, González 1999, González 2003, González 2004, González and Fernández Yépez 1992, González and Fernández Yépez 1993, González et al. 2006, Moraes and Duarte 2014). Venezuela is considered a megadiverse country (Rodríguez and Rojas-Suárez 2008), and while the largest number of species-group taxa in the subfamily is found in Brazil, the relatively large number of taxa found in Venezuela should not be a surprise.

Besides a number of taxa of economic relevance, Castniinae contains rare and endemic species with restricted geographical ranges resulting in a scarcity of material in insect collections worldwide (González and Cock 2004, González et al. 2006, González and Stüning 2007, Lamas 1995, Lamas 2004, Miller 1986, Miller 2008). Among the interesting genera of the family we find *Synpalamides* Hübner, 1823; most species of which are found in South America, with very few from Mexico (Lamas 1995, Miller 1995); the Mexican ones are quite different from those from Brazil and should be placed in another genus (JMG and JY Miller in prep.). There is also some doubt

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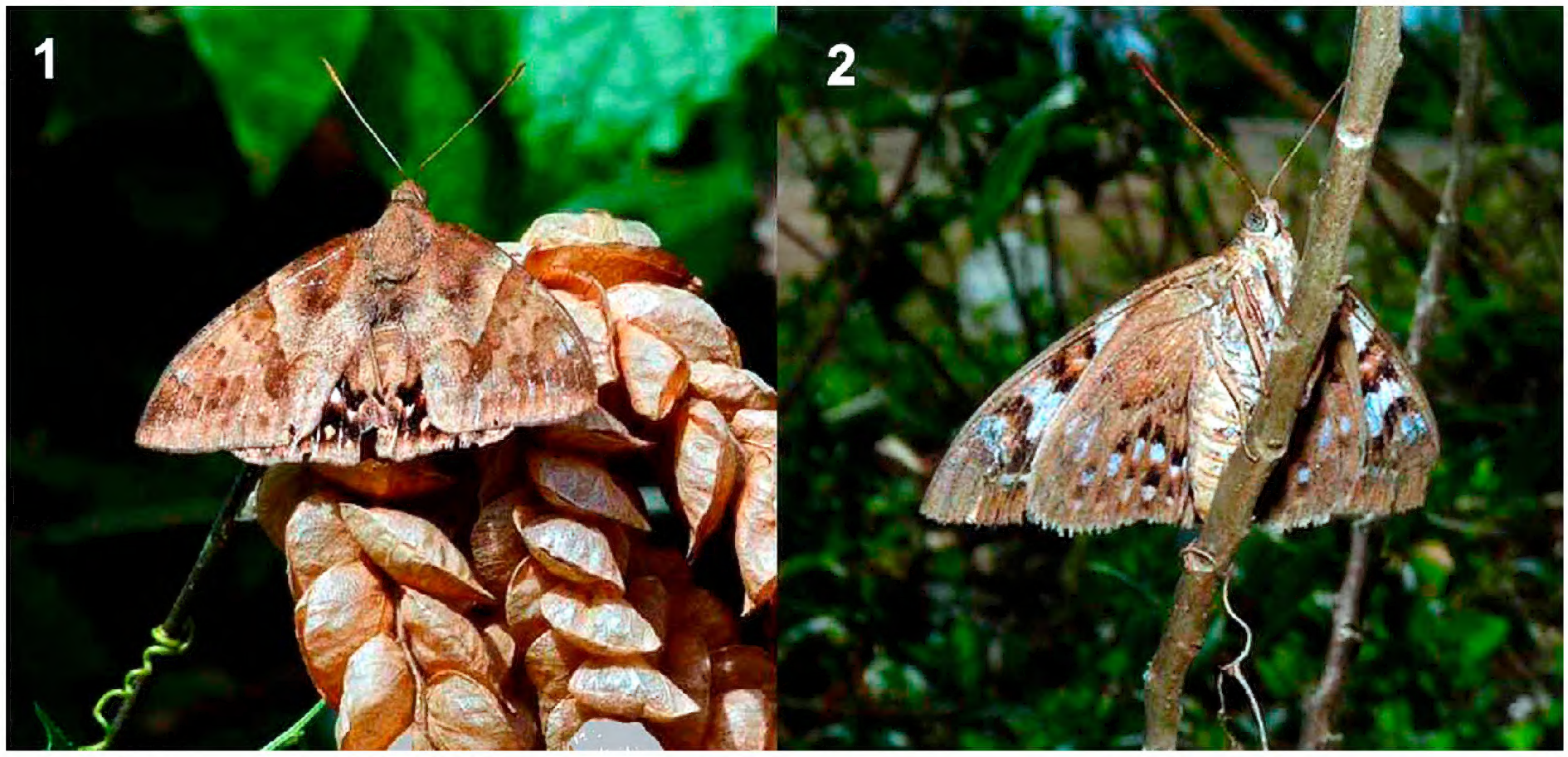


Figures 1, 2. 1. *Synpalamides phalaris* showing the typical stegopterous position while perched on *Flemingia strobilifera* (L.) W.T. Alton (Fabaceae) in a disturbed lowland forest in Innis Field, southern Trinidad. **2.** Ventral view of moth perched on an unrecognized plant stem in the dry semi-seasonal forest of L'eau Michele, Southern Watershed Reserve, southern Trinidad. (Photographs: K. Sookdeo)

about the specific separation of the South American species *S. orestes* (Walker, 1854) and *S. rubrophalaris* (Houlbert, 1917) (Ríos and González 2011). Even though the species *S. phalaris* (Fabricius, 1793) is mainly found in southern Brazil, specimens have also been collected in other South American countries (Miller 1986).

Synpalamides phalaris was described (as *Papilio phalaris*) by Fabricius in 1793. The most complete revision of Castniidae before the 21st Century was that of Houlbert (1918) and he divided the genus *Synpalamides* (as *Sympalamides* [sic]) into "three sections." He included *S. mimon* Hübner, 1823 (from Rio De Janeiro, Brazil) (incorporating *phalaris* as a "synonym" of *mimon*), *S. mimon lombardi* Houlbert, 1918 (from Parana, Brazil), *S. mygdon* (Dalman, 1824) (from Chaco de Santa Fé, Argentina and Brazil), *S. rubrophalaris* (from Bahia and also "the central regions", Brazil) and *S. argus* Boisduval, 1875) (from Brazil) in the first section. *S. subvaria* (Walker, 1854) (from Rio de Janeiro, Brazil), *S. subvaria dionaea* (Hopffer, 1856) (from Brazil), *S. albofasciata* (Schaufuss, 1870) (from Brazil) and *S. sora* (Druce, 1896) (from San Jose, Paraguay) were listed in the second section. In the third section, Houlbert (1918) only listed *S. chelone* (Hopffer, 1856) from Mexico, as he was uncertain of its relationship with the other species in the genus (Miller 1986). Many years later, Miller (1995) published a checklist considering *S. albofasciata*, *S. argus*, S. *mimon*, *S. mygdon*, *S. sora* and *S. phalaris* as valid species, the latter including subspecies *phalaris* and *subvaria.* Then Lamas (1995) included *mimon*, *mygdon*, *subvaria*, *dionaea*, *albofasciata*, *argus*, *klugii* (Boisduval 1875), *musarum* (Westwood, 1877), *sora*, *subvaria subvariana* (Strand, 1913), *mimon lombardi* and *signata* Talbot and Prout, 1919 as synonyms of *S. phalaris.* Lately, Moraes and Duarte (2014) ratified *phalaris* as a valid species with all the synonyms previously established by Lamas (1995).

Besides presenting general information on *S. phalaris*, the main aim of this note is to confirm its presence in Venezuela, from where it has not previously been reported.

Methods

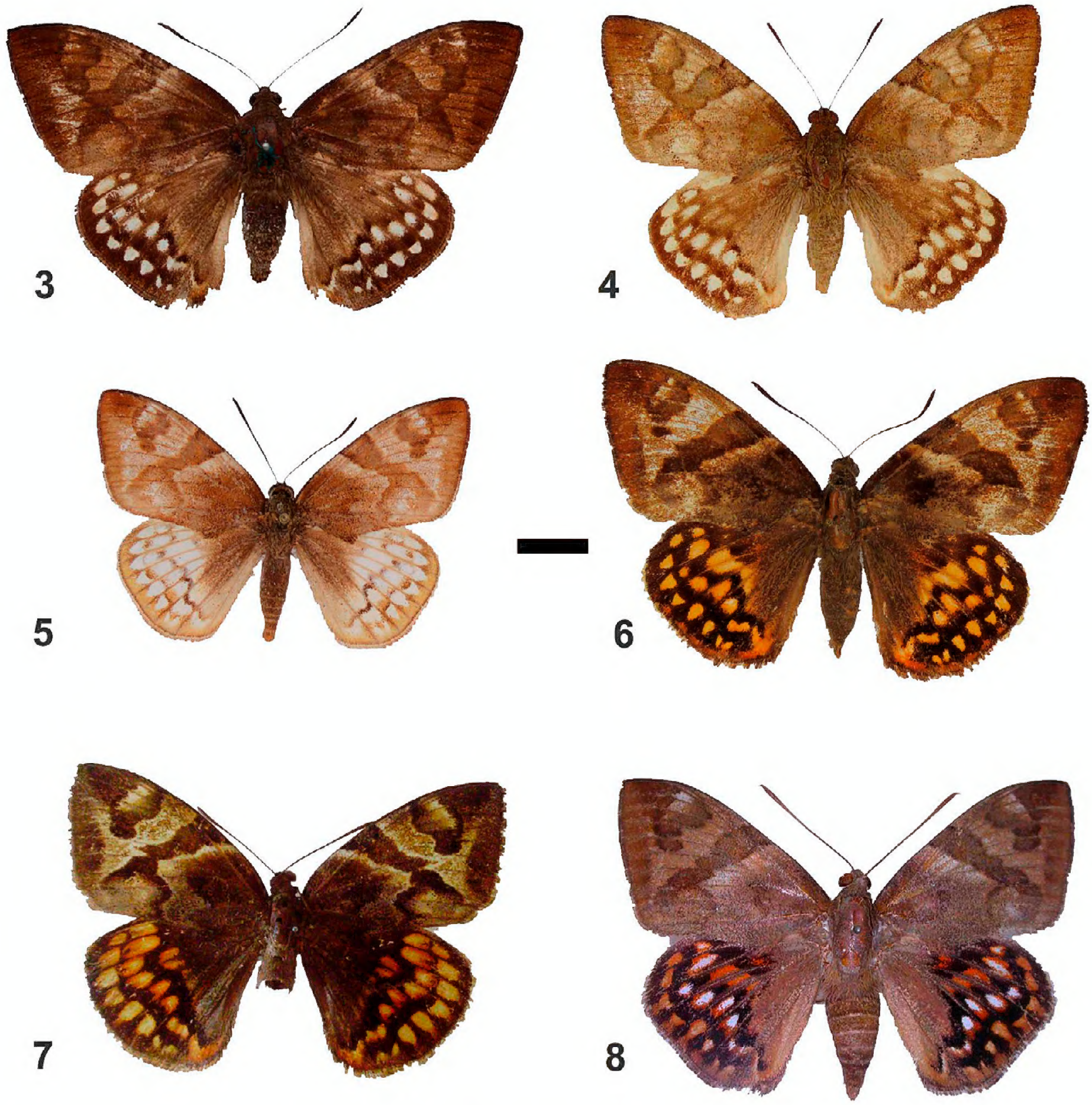
The Castniidae of the insect collection of the California Academy of Sciences, San Francisco, California, USA, as well as the personal collection of Bob Worthy, Caterham, Surrey, UK, were reviewed. Two specimens (one from each collection) of *S. phalaris* originally collected in Venezuela were selected, identified and compared with type material as well as specimens from other localities deposited in the Natural History Museum, London, and the McGuire Center for Lepidoptera and Biodiversity, Gainesville, Florida, USA.

Specialized literature was consulted, as were experts on Castniidae collecting and the flora of Trinidad and Venezuela.

Results

Material examined. 1 male, Venezuela, 1434, R.H. Stretch Collection (Insect Collection, California Academy of Sciences, San Francisco); 1 male, E – Venezuela / Amacuro Oronoco [sic] Delta / Mangroven. Umg. Monagas / Camp Buja, 09°35′24″ N, 062°27′53″ W, 30.01 – 01.02, 1995 / NN 0-13, leg. A Steidel, R. Buchbach, *Synpalamides phalaris* Fabricius, 1973 [sic] (coll. Bob Worthy).

Synpalamides phalaris (Figs 1, 2) is highly variable phenotypically (Miller 1986, Miller pers. comm.), which combined with the scarcity of collected specimens could



Figures 3–8. *Synpalamides phalaris* **3.** Specimen originally from the Richard Harper Stretch collection and now at the California Academy of Sciences, San Francisco. One of its labels reads "Venezuela" as the collecting locality. **4.** Specimen collected in Yabinoko, in the Orinoco Delta, Monagas state, Venezuela. **5.** Specimen that fits the description of "*S. phalaris lombardi*" (Houlbert, 1918), from Santa Catarina, Brazil. **6.** Specimen from Santa Catarina, Brazil. (Specimens 4–6 deposited in Bob Worthy Collection.). **7.** Specimen from Asunción, Paraguay, deposited in the insect collection of Facultad de Ciencias Agrarias, Departamento de Entomología, Universidad Nacional de Asunción, San Lorenzo, Paraguay. **8.** Specimen from Caroni Swamp, Caroni, Trinidad, deposited in M.J.W. Cock Collection. Scale: 10 mm. (Photographs: 3: J.M. González; 4–6: B. Worthy; 7: S. Ríos: 8: M.J.W. Cock)

be one of the reasons why many of its forms have been described as distinct species or subspecies. The representative specimens of *S. phalaris* possess a distinctive forewing and hindwing maculation combined with a series of extradiscal spotbands on the hindwing (Figs 3–8). The ground colour of the hindwings is basically brown with lighter brown on the lateral margin and with a pale white to tan or even pale orange postmedian spotband that starts at the costal margin but fades by the middle of the wing without reaching the anal margin (Figs 3–8). There is a slight sexual dimorphism in these species and the forewing markings are highly accentuated in the females. The females' extradiscal and submarginal spotbands may be enlarged and white scales can be heavily outlined (Miller 1986). In general, there are 2 irregular extradiscal bands that follow the pattern of the postmedian one. The spots may be variously coloured ranging from white (Figs 3–5) to tan or pale orange (Figs 6, 7), to reddish orange (Fig. 8). The 2 Venezuelan specimens (even though 1 is paler than the other) are brown. Their overall markings in the fore- and hindwings follow the typical markings of the species. However, the postmedian band is faint when compared with specimens from other regions (Figs 3–4). The spots of this and the extradiscal bands are all white;

in other populations studied they range from white to tan to reddish orange; some specimens that fit the "*Sympalamides* [sic] *mimon lombardi*" description (Houlbert 1918) from Santa Catarina, Brazil (Fig. 5) appear even more white, with all dark markings very faded. Both Venezuelan specimens are strikingly similar, and even though one of them was clearly found in a locality relatively close to Trinidad, the *S. phalaris* specimens we have seen from the latter country possess postmedian and extradiscal bands with white and tan spots surrounded by, or almost covered with, reddish orange scales (Fig. 8). The spot bands of the Venezuelan specimens (Figs 3, 4) are on the paler end of the scale of variation for the species but are not unusual. On the other hand, the specimen from Trinidad (Fig. 8) is very unusual; it is very similar to Boisduval's (1875) "*argus*" (from Brazil), which is quite a rare form and probably transitional to "*Castnia* (*Sympalamides* [sic]) *signata* Talbot and Prout, 1919" (Talbot 1919).

The genital capsule and penises (Figs 10–12) of the species are slightly sclerotized; the first have the uncus fused, blunt; gnathos heavily sclerotized; valve lobate with sacculus weakly developed; saccus blunt, enlarged. Valva in the Venezuelan specimen (Fig. 10) is slightly triangular, while those of the Brazilian ones are more rounded (Figs 11, 12). Penises of the 3 specimens studied are deeply curved and contorted. However, that of the Venezuelan specimen (Fig. 10) is more than double the length of the Brazilian ones (Figs 11, 12).

Discussion

Not much is known about the life history of *Synpalamides phalaris*, however females have been observed laying eggs on terrestrial and epiphytic Bromeliacae in the genera *Guzmania* Ruiz & Pav. and *Bromelia* L. (Miller 1986). Adults have also been observed flying around *Bromelia balansae* Mez and *Pseudananas sagenarius* (Arruda) Camargo (Bromeliaceae) and have been associated with pineapple (*Ananas*; Bromeliaceae) and bananas (*Musa*; Musaceae) in their southernmost distribution (Jörgensen 1930, Penco 2011, Ríos and González 2011). The species has been collected and reported flying from October to November and January to February in Brazil and Paraguay and is probably bivoltine (Biezanko 1961, Miller 1986, Ríos and González 2011). Individuals seem to fly from 10:00 h to 12:00 h at around 8–15 m above the ground in a fluttery pattern similar to *Taygetis* spp. and other Satyrinae (Miller 1986). They tend to perch vertically with their head uppermost, frequently camouflaged in their habitat (Miller 1986) (Figs 1, 2).

Most of the known specimens of *S. phalaris* deposited in collections worldwide have been found in the coastal states of southeastern Brazil, but specimens are known from the Brazilian state of Amazonas, and some have also been found in Argentina, Paraguay, Bolivia, Uruguay and Trinidad (González and Cock 2004, González and Stüning 2007, González et al. 2010, González et al. 2013, Miller 1986, Penco 2011, Ríos and González 2011) (Fig. 9). Despite this wide geographic distribution, data from its western and northernmost collecting sites are scarce. González and Cock (2004) mentioned only 2 specimens of *S. phalaris* known from Trinidad and had access to only 1 of them. After their work was published at least 3 other specimens have been found from lowland forests with an abundance of *Aechmea aquilegia* (Salisb.) Griseb. (Bromeliaceae) in southern localities in that Caribbean Island (K. Sookdeo pers. comm.) (Figs 1, 2, 9).

While curating the California Academy of Sciences (CAS, San Francisco, California) collection of Castniidae, JMG came across a specimen of *S. phalaris* bearing 3 labels, 1 of which clearly mentions "Venezuela" (without further data) as the collecting locality (Fig. 3). This specimen was originally in the collection of Richard Harper Stretch (1837–1926), a miner, geologist and entomologist, interested mainly in moths (Essig 1931, Mallis 1971). He travelled to some Latin American countries, the southernmost being Panama (Stretch 1926, Stretch 2008). His insect collection was bought by friends and donated to the American Museum of Natural History; when he died the insects that remained with him were donated to CAS (Essig 1931). Among those insects there were several Castniidae, including the *S. phalaris* shown herein (Fig. 3). Stretch was in contact with numerous entomologists and insect traders worldwide and bought or traded many specimens that enriched his collection (Stretch 2008). Even though the species was known from the nearby island of Trinidad, *S. phalaris* had never been reported from Venezuela, so we cautiously thought that the Stretch specimen could have been mislabelled. However, Venezuela clearly has an influence on Trinidad (González and Cock 2004), with some northeastern Venezuelan forests sharing plant species and habitats with those in southern and western Trinidad. The island geology and terrestrial biodiversity is basically an extension of South American origin and clearly a relict biota of the immediate Orinoco Delta region (Lacerda et al. 1993, Philip et al. 2013). We also thought that it was not unlikely that populations of *S. phalaris,* which occurs in Trinidad, might also be found in neighbouring Venezuela.

More recently, BW acquired a specimen of *S. phalaris* (Fig. 4) collected in Monagas State, Venezuela, on the northwestern side of Caño Manamo, in the Orinoco Delta (Fig. 5), a record that definitively confirms the presence of the species in Venezuela.

The area where this specimen was found is near the Warao community of Yabinoko, which is located near the northern side of an arc that Caño Buja makes before reaching Caño Manamo from its western side. Yabinoko is properly located in the delta of the rivers Tigre and Morichal Largo in what is known as the "Delta Medio" of the Orinoco Delta (V. González pers. comm.). This is the Orinoco Delta Swamp Forest ecoregion, which is a continuous expanse from the southern reaches of the Paria Peninsula in northeastern Venezuela, extending

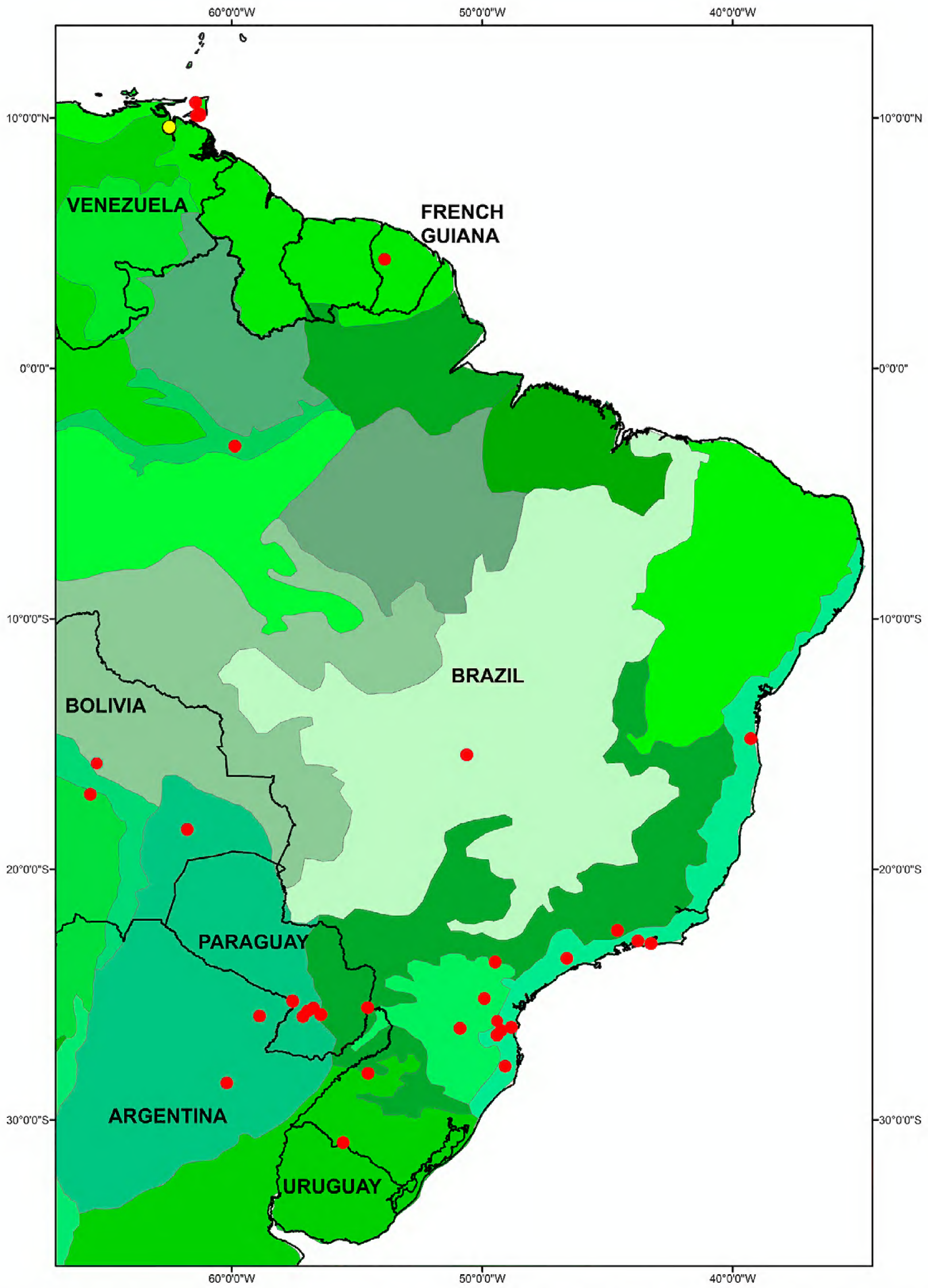
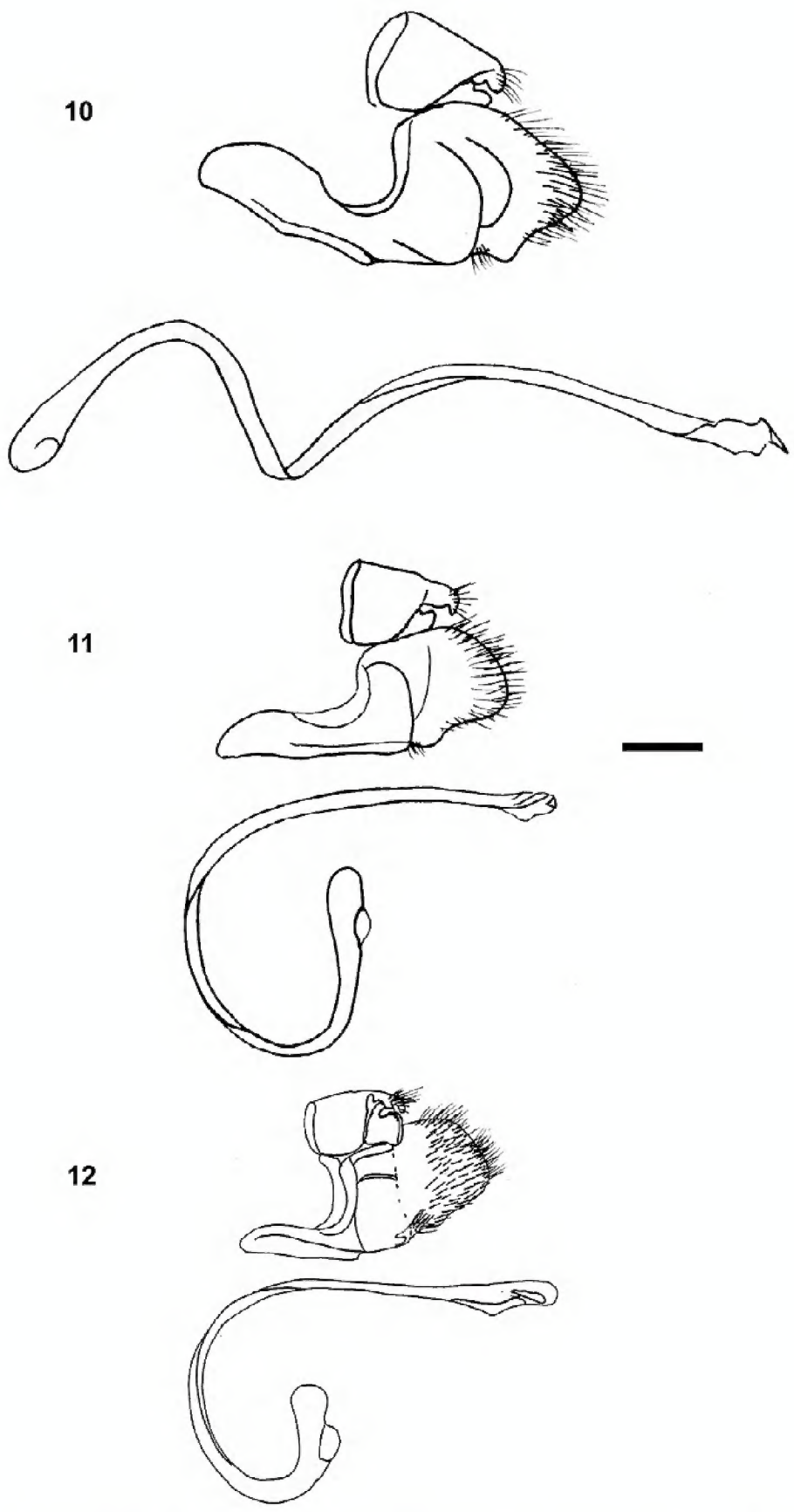


Figure 9. Map (based on Morrone 2014) of a section of South America, showing the distribution of *Synpalamides phalaris* (Fabricius) in South America. Every red dot corresponds to detailed site information data from specimens deposited in various insect collections worldwide or clearly designated localities found in literature. The yellow dot represents the detailed record (out of two) of *S. phalaris* from Venezuela and mentioned in this work. (Map elaborated by Bolívar R. Garcete-Barrett).

southwards along the coastal floodplains of the Orinoco Delta to the Waini River in Guyana (Huber and Alarcon 1988). The vegetation that predominates is that of a tropical ombrophilous swamp forest which includes hygrophilous trees (mangroves), palms, an abundance of epiphytes (i.e. Bromeliaceae and Orchidaceae) as well as scattered natural pastures of *Leersia hexandra* Sw. and *Hymenachne amplexicaulis* (Rudge) Nees (Poaceae) (V. González pers. comm.)

Despite the similarities in the genitalia of the studied specimens (Figs 10–12), the extremely large penis of the Venezuelan specimen (which looks somehow "uncoiled" due to the fact that it was completely dried when the drawing was made) (Fig. 10) might indicate that we are possibly looking at an extreme feature of a cline or potentially a different subspecies of *S. phalaris*.



Figures 10–12. Genitalia (genital capsule and penis) of *Synpalamides phalaris* from (**10**) Orinoco Delta, Monagas State, Venezuela, (**11**) Santa Catarina, Brazil, (**12**) Rio de Janeiro, Brazil [drawing copied from Miller (1986) with permission]. Scale: 1 mm.

The distances between the southeastern Brazil and southeastern Paraguay localities and other populations of *S. phalaris*, especially the northern ones, are quite large (Fig. 9). This, and the above mentioned differences in the genitalia of the Venezuelan specimen (Fig. 10) when compared to the Brazilian ones (Fig. 11, 12), might suggest that *S. phalaris* has at least 2 subspecies, 1 from northern South America and another from southern South America. In order to clearly assess that, further studies and collecting sites in the "gap" area between the southern South American sites in Bolivia, Uruguay, northern Argentina, northwestern Paraguay and southeastern Brazil, and the most northerly ones in northern Brazil, eastern and southeastern Venezuela and the Guianas (Fig. 9) are certainly needed. Only then could the greater number of specimens help us to improve our knowledge of the geographic distribution, natural history and taxonomy of the species.

Even though the northernmost specimens of the species were already known from the island of Trinidad (González and Cock 2004), our new record of *S. phalaris* extends the geographic distribution of the species to Venezuela, west of Trinidad and Tobago.

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Authors' Contributions

JMG and BW collected the data, identified the specimens and wrote the text.

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